

# (12) UK Patent Application (19) GB (11) 2 267 101 (13) A

(43) Date of A publication 24.11.1993

(21) Application No 9206927.7

(22) Date of filing 30.03.1992

(71) Applicant  
Ljubomir Gnjatovic  
5 Kingsley Avenue, London, W13 0EQ,  
United Kingdom

(72) Inventor  
Ljubomir Gnjatovic

(74) Agent and/or Address for Service  
Laurence Shaw  
5th Floor, Metropolitan House, 1 Hagley Road,  
Edgbaston, Birmingham, B16 8TG, United Kingdom

(51) INT CL<sup>5</sup>  
E04C 2/36, B32B 3/12

(52) UK CL (Edition L)  
E1D DCF2 DF193 D1072 D2137 D2141 D401 D402  
D404 D408 D421 D547

(56) Documents cited  
GB 1269244 A

(58) Field of search  
UK CL (Edition L) B5N, E1D DCF DF113 DF116  
DF193  
INT CL<sup>5</sup> B32B, E04C

## (54) Insulating board

(57) A board useful as the wall of a container or building is lightweight, thermally-insulating, and of high mechanical strength, and comprises two spaced apart panels (P1, P2) and an infill between the panels, the infill comprising a grid formed of walls defining cells (C), the walls extending transverse to the panels, the cells being filled with set material, a discontinuity (20) being present to prevent the transfer of heat and/or moisture from one panel to the other panel along a cell wall. The discontinuity may be adjacent one or both walls or may be central; it may when central comprise an evacuated chamber.

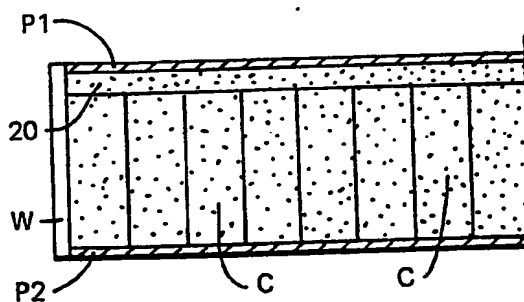
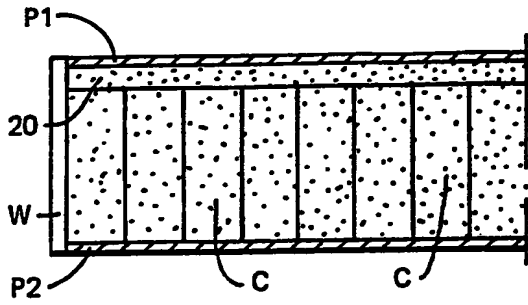
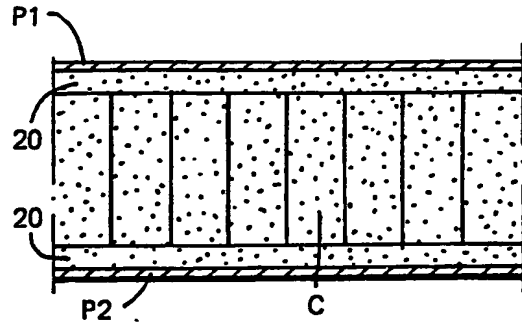


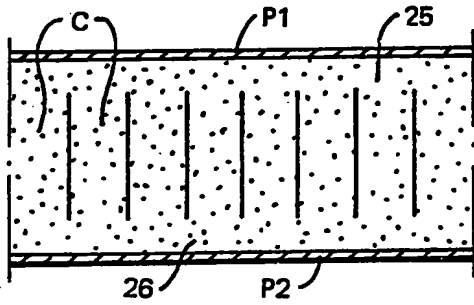
FIG. 1



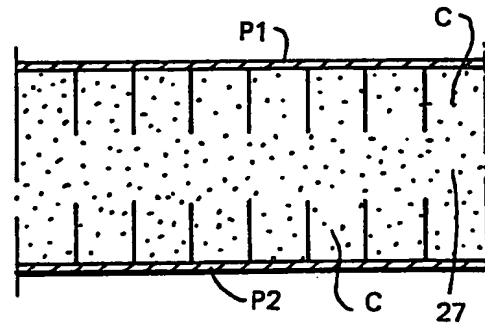
**FIG. 1**



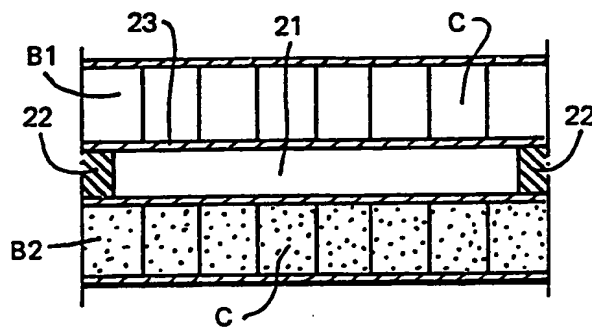
**FIG. 2**



**FIG. 3**



**FIG. 4**



**FIG. 5**

REINFORCED WALL STRUCTURE

The invention relates to a reinforced structure and in particular to a reinforced board useful as the wall of a container, building or the like. The structure may also be used as a vehicle body, partition, screen, or the like. The wall may be a sidewall, floor roof or tray. One particular use of the board is as a wall of a refrigerated container which may be a fixed part of a vehicle or a separate container.

It is known to make a board of two panels joined together with an infill in between. It is known to use a honeycomb structure as the infill, the walls of the honeycomb cells being made of say coated paper, plastic or metal. The cells of the honeycomb may be empty so that only air is present, although it is known to coat the walls of the cells with various materials see e.g. US-A-3170827. It has also been proposed to fill the cells of the honeycomb with a reinforcing filling material see e.g. EP-A-0008960.

It is one object of the invention to provide a wall structure which is lightweight, thermally insulating and of high mechanical strength.

In one aspect the invention provides a board comprising two

spaced apart panels and an infill in between, the infill comprising a grid formed of walls defining cells, the walls extending from one panel towards the other, the cells being filled with set material, a discontinuity being present to prevent the transfer of heat and/or moisture from one side wall to the other sidewall along a cell wall.

The discontinuity may take a variety of forms. In one option, the discontinuity comprises a layer or sheet of set material such as plastics, e.g. polyurethane foam or neoprene disposed along the inner surface of one or both panels. In another option, the honeycomb cells are present adjacent the inner surface of each panel, and a middle layer of set resin foam is present in between. In a much preferred feature, the discontinuity comprises an airtight sealed chamber present near the midline of the board.

The honeycomb may be formed of paper, coated paper (preferably resin coated), metal strip or foil; or the like. The section may be of rectangular parallelepiped shape having cells of hexagonal, octagonal, ellipsoidal, circular or like cross sectional shape. The density of the cells may be varied.

One or both panels may be of cardboard, hardboard, mineral board, plywood, laminates, reinforced plastics and metals e.g. aluminium, steel, stainless steel; and the like.

The settable material may be hydraulic (as in the case of cement or the like) or a hardenable resin, e.g. polystyrene, isocyanate, polyurethane, polyester, phenolic or the like. It is preferred that the set material take the form of a foam for lightness in weight. Additives may be present, especially fillers, the proportion of which may be varied according to the desired compressive strength, heat insulation or the like.

The set material may be a single or multi component polyurethane system adapted to provide a foam. Such a single component system comprises a prepolymer with a blocked or bonded NCO group and a latent hardener which in the presence of moisture are converted into reactive compounds so that curing can take place. The component may include fillers, catalysts, auxiliary curing agents and like additives. The prepolymer may be formed by reacting a polyisocyanate, typically an aromatic diisocyanate, with polyols and chain extending and/or cross linking agents.

In order that the invention may be well understood it will now be described, by way of example only, with reference to the accompanying diagrammatic drawings, in which:

Figure 1 to 5 are each transverse sections through different embodiments of the invention.

The same reference numerals are used to describe the same parts in the different embodiments.

The board of Figure 1 comprises a single layer of a honeycomb structure, defining a plurality of cells C. The honeycomb is made of resin coated paper. A sheet of metal, plastics, wood or like is present on the top P1 and bottom P2 of the honeycomb; preferably the sheet is of stainless steel. Each cell C of the honeycomb is filled with a hardened or cured low density plastics foam, typically a polyurethane foam S. Sidewalls W are secured to the top and P1 and the bottom panel P2 to close the edges of the board.

A sheet 20 of polyurethane foam or neoprene is laid between the top edge of the cell grid and the upper stainless steel panel P1. This prevents moisture and/or heat flowing up or down the cell wall to bridge the board. In Figure 2, there are two such sheets 20 one located on the inner face of each of the panels P1, P2, and which may be of the same or different material. In the embodiment of Figure 3, the honeycomb is in the middle of the board with a relatively thick layer of set polyurethane foam on each side so that the honeycomb is not in contact with the outer panels. In the embodiment of Figure 4, there are two honeycombs, each bonded to a respective panel, a layer of honeycomb-free set polyurethane being present in between. In Figure 5, the board has two elongate board parts B1, B2, separated by a vacuum

chamber 21. As shown the upper part has empty or full cells. The vacuum chamber includes sealed end walls 22. One of the boards incorporates a vacuum port 23 which the chamber is evacuated. Dessicant may be placed in the vacuum chamber to reduce condensation. The board of Figure 5 is made by locating one board part on the other, with the end walls 22 in between. The walls 22 are sealed in gas tight manner to both board parts. A vacuum is created in the chamber 21, through the port 23. The chamber may be connected to a vacuum pump to withdraw any air which penetrates the seal; a pressure gauge may be provided and arranged to switch on the vacuum pump in the event that the air penetrates the chamber.

The invention is not limited to the embodiment shown. The resin need not be polyurethane, and not all the cells need be filled. the walls of the cells may be apertured, to allow set polyurethane foam to bridge from one cell to the next.

CLAIMS

1. A board comprising two spaced apart panels and an infill in between, the infill comprising a grid formed of walls defining cells, the walls extending from one panel towards the other, the cells being filled with set material, a discontinuity being present to prevent the transfer of heat and/or moisture from one side wall to the other sidewall along a cell wall.
2. A board according to Claim 1, wherein the discontinuity comprises a layer or sheet of set material such as plastics, e.g. polyurethane foam or neoprene disposed along the inner surface of one or both panels.
3. A board according to Claim 1, wherein the honeycomb cells are present adjacent the inner surface of each panel, and a middle layer of set resin foam is present in between.
4. A board according to Claim 1, wherein the discontinuity comprises an airtight sealed vacuum chamber near the mid-line of the board.



5. A board according to Claim 4, wherein a vacuum pump is connected to the chamber.
6. A board according to Claim 5, wherein a pressure gauge is connected to the chamber and arranged to actuate the vacuum pump when the pressure exceeds a predetermined limit.

**Patents Act 1977**  
**Examiner's report to the Comptroller under**  
**Section 17 (The Search Report)**

Applicant number

GB 9206927.7

**Relevant Technical fields**

(i) UK Cl (Edition L ) E1D DCF DF193 DF113 DF116  
B5N

(ii) Int Cl (Edition 5 ) E04C B32B

**Databases (see over)**

(i) UK Patent Office

(ii)

**Search Examiner**

J D CANTRELL

**Date of Search**

9 JUNE 1993

Documents considered relevant following a search in respect of claims 1-6

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
X	GB 1269244 (UNITED)	1

BEST AVAILABLE COPY

Category	Identity of document and relevant passages	Relevant to claim(s)

BEST AVAILABLE COPY

### Categories of documents

**X:** Document indicating lack of novelty or of inventive step.

**Y:** Document indicating lack of inventive step if combined with one or more other documents of the same category.

**A:** Document indicating technological background and/or state of the art.

**P:** Document published on or after the declared priority date but before the filing date of the present application.

**E:** Patent document published on or after, but with priority date earlier than, the filing date of the present application.

**&:** Member of the same patent family, corresponding document.

**Databases:** The UK Patent Office database comprises classified collections of GB, EP, WO and US patent specifications as outlined periodically in the Official Journal (Patents). The on-line databases considered for search are also listed periodically in the Official Journal (Patents).